



Catalog  
No.09S

# STATIC & DYNAMIC RESTRAINTS



***CARPENTER & PATERSON, INC.***

**DESIGNERS • ENGINEERS • MANUFACTURERS**

**1. PRICES & DESIGNS:** Prices and designs are subject to change without notice. All prices are F.O.B. point of shipment, unless otherwise stated.

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**6. PRODUCT APPLICATION:** Seller's products are indented for installation and service as illustrated or described in seller's catalog. Seller shall not be responsible for any losses or damage sustained by the buyer or any other person as a result of misapplication.

Buyer shall defend, indemnify and save seller harmless from any and all liability or alleged liability, expenses, including legal fees arising from personal injuries including death or damage to property caused by reason of improper and/or negligent installation of pipe hangers designed and fabricated by seller.

In accordance with our product development program, we reserve the right to revise the design and application of our products without notification. For latest product information, please contact the nearest Carpenter & Paterson office.

**7. WARRANTY:** Carpenter & Paterson, Inc. warrants for one (1) year from date of shipment that all products of Carpenter & Paterson manufacture will be free from defects in material and workmanship when used for the purpose which Carpenter & Paterson recommends. Carpenter & Paterson warrants the products which it sells of other manufacturers only to the extent they are warranted to Carpenter & Paterson by the supplier. Claim for breach of the above warranty must be made within thirty (30) days from the date the material was determined by the Buyer to be defective or in any event within twelve (12) months from the date of delivery to the original users, unless otherwise stated. If Carpenter & Paterson deems to its satisfaction that the products are defective, the product will be repaired or replaced by Carpenter & Paterson, and no other charge will be allowed for labor or expense in repairing or replacing said product by the Buyer. In any event the amount of any adjustment shall not exceed the net sales price of the defective product. Where engineering design or fabrication work is supplied, Buyer's acceptance of Seller's design or delivery of work, shall relieve Carpenter & Paterson of all further obligation other than as expressed in Carpenter & Paterson's product warranty. The foregoing constitutes the Purchaser's sole and exclusive remedy under Carpenter & Paterson warranty. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF FITNESS OR FITNESS FOR A PARTICULAR PURPOSE. CARPENTER & PATERSON MAKES NO WARRANTY OF MECHANABILITY. IN NO EVENT AND UNDER NO CIRCUMSTANCES WILL CARPENTER & PATERSON BE LIABLE FOR PERSONAL INJURY OR PROPERTY DAMAGE ARISING IN ANY MANNER OUT OF THE USE OR APPLICATION OF THE GOODS WHICH ARE THE SUBJECT OF THIS PROPOSAL. UNDER NO CIRCUMSTANCES AND IN NO EVENT WILL CARPENTER & PATERSON BE LIABLE FOR CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES WHETHER FOR BREACH OF CONTRACT OR WARRANTY, NEGLIGENCE, OR ANY OTHER TORTIOUS ACT OR OMISSION.

The terms of this warranty can be modified or changed only by authorization in writing by an officer of Carpenter & Paterson, Inc. Carpenter & Paterson neither assumes, nor authorizes any person to assume for it any obligation in connection with the sale of its products or parts of products which have been; repaired or altered outside of Sellers factory; subject to misuse, negligence, or accidents; or used in a manner contrary to the Seller's instructions or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by the Buyer, or its representative. Carpenter & Paterson, Inc. reserves the right to revise product design without notification.

**8. TAXES:** The amount of taxes applicable to the sale of material or services shall be added to the purchase price and shall be paid by buyer unless buyer provides seller with an exemption certificate acceptable to the taxing authorities.

**9. PRICING INFORMATION:** Orders Of any size will be accepted. However, orders less than \$150.00 will be subject to a \$25.00 Handling Charge in addition to the cost of the material and freight, if any. Prices are subject to change without notice. We are not responsible for typographical errors.

**10. TERMS:** Net thirty (30) days; 1-1/2% per month service charge (18% per annum) will be charged on all delinquent accounts plus court costs and attorney fees.

**C**arpenter & Paterson is a complete line manufacturing and engineering organization offering pipe hangers, supports, restraints and specialty devices to support and control piping and equipment used in fossil power generating stations, petro-chemical plants and other industrial processing piping systems.

In addition to our product line, representing one of the most complete in the industry, Carpenter & Paterson provides complete engineering and technical services, including analysis, hanger design and detailing, and other construction support programs. To provide effective distribution of our products and services, engineering and sales offices are maintained in major cities throughout the continental United States and Canada.

**GENERAL NOTES**

Outline dimensions and data shown in this catalog are for reference only are not intended for inspection purposes.

Designs and dimensions are subject to change without notice.

All hanger products shown herein are manufactured in accordance with industry standards and are for installation and service as described. When used for other purposes or in ways other than those for which designed and manufactured, Carpenter & Paterson cannot be held responsible for the product failure, injuries, or property damage.

Cataloged products meet requirements of MSS-SP-58 and MSS-SP-69.

Maximum rated loads for hangers are based on a safety factor applicable to the codes listed in this catalog or the allowable stresses specified in ASME B31.1, ASME B31.3 and MSS-SP-58.

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### INTRODUCTION

Carpenter & Paterson markets a wide selection of restraint assemblies and devices which allows the designer to select devices technically and economically suited for the specific application, by type, size and configuration.

Carpenter & Paterson restraint systems now cover a broader range of load ratings and allow greater flexibility in field adjustment. High precision steel ball bushings and pins are now standard components throughout the line. Also included is a new series of restraint yoke clamps.

Carpenter & Paterson hydraulic snubbers have also been improved and are available with options to better suit the different conditions the application requires.

### SPECIFICATIONS

All Carpenter & Paterson restraints are designed to meet requirements of: Manufacturers Standardization Society SP-58, Manufacturers Standardization Society SP-69 and ASME Code for Pressure Piping, ASME B31.1 and Process Piping ASME B31.3.

### RIGID STRUT ASSEMBLIES

**RECOMMENDED SERVICE:** Used to restrain movement of piping in one direction. Movement due to thermal expansion in other directions should be evaluated.

#### STANDARD DESIGN FEATURES:

- Designed to restrain tensile and/or compressive forces.
- Tight fitting connections allow positive control of piping systems.
- Spherical, self-aligning ball bushing at both ends of the strut allow for  $\pm 5^\circ$  of angular motion or misalignment.
- Can be installed in any spatial orientation.
- Field adjustment is available in all assemblies.
- All welding work required in the field is recommended to be fillet welds.
- Paint – Standard primer finish.

### HYDRAULIC SNUBBER ASSEMBLIES

**GENERAL APPLICATION:** Used for the control and protection of piping and equipment subject to shock (impulse) loading and swaying (cyclic) conditions. Its use transfers any imposed forces on the piping or equipment directly to the building structure at the instant of shock occurrence, while at all other times allowing free unrestricted movement through its normal operating range.

#### SPECIFIC APPLICATIONS:

- Earthquake protection
- To prevent damage by wind in outdoor installations
- Employed at points in piping systems subject to shock loadings generated by quick closing valves, water hammer, relief valve reaction or other applied shock loads.

#### STANDARD DESIGN FEATURES:

- Piping and/or equipment movement is controlled by tamper-proof dual stage flow control poppets designed with self-cleaning orifices.
- Furnished as a complete, compact, and efficient unit, ready for immediate use.
- Manifold configuration requiring no external piping.
- Spherical, self-aligning ball bushings allow for  $\pm 5^\circ$  of angular motion or misalignment.
- Pressurized hydraulic reservoir allows mounting in any spatial orientation.
- Virtually no resistance to normal thermal movements of the piping.
- Paint – standard primer finish.
- Large restraining forces compared to size.
- Functions in restraining tension and compression.
- Stroke determination is made from built-in-datum point located on piston rod wrench flats.
- Fluid Level Indicator – Provides concise determination of exact fluid level in the unit, thereby eliminating estimate of reserve fluid level.

#### OPTIONAL DESIGN FEATURES:

- Remote Reservoir Mounting – The snubber's pressurized reservoir can be remotely mounted for snubber locations that are difficult to reach.
- Integral Relief Valve – A non-adjustable valve, which is factory preset at 133%, or 200% of rated load.
- Protective Boot – Installed over the piston rod for protection in corrosive and/or dusty areas.
- Rigid Strut Application – When no thermal growth is anticipated after lock-up an optional poppet valve, without bleed, is furnished. Must be ordered with optional integral relief valve.

# STRUCTURAL ATTACHMENT

## Figure 1000

**Size Range:** 700 through 130,000 pounds ( 3,114 N through 578,240 N) load.

**Material:** Carbon steel except load pin which is stainless steel.

**Service:** For attachment of struts to structures.

**Max. Temp.:** 350°F (177°C) for the rated loads shown.

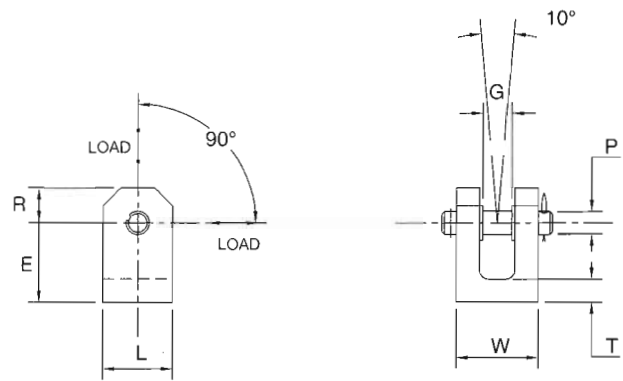
**Features:** Can be used as a second end attachment.

**Used With:** Carpenter & Paterson figure numbers 2015, 2250, 2252, 2525, 2530.

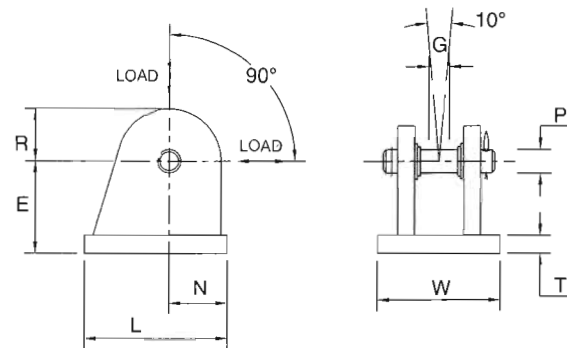
**Ordering:** Specify figure number and size.

For metric applications specify figure M1000 and size.

**NOTE:** This product is designed to function with a 10° cone of action, and a 90° arc of loading. Loading beyond this cone or arc is not recommended.



SIZES .7 THROUGH 4



SIZES 7 THROUGH 130

FIGURE 1000 – STRUCTURAL ATTACHMENT

SIZE	LOAD	E	G	L	N	P	R	T	W	WEIGHT
.7	700	1 7/8	1/2	1 1/8	9/16	3/8	1/2	1/2	1 1/2	0.50
.7	3114	48	13	29	14	10	13	13	38	0.23
1.5	1,500	2 1/4	5/8	1 1/2	3/4	1/2	3/4	1/2	1 3/4	1.0
1.5	6673	57	16	38	19	13	19	13	44	0.5
4	4,000	2 1/4	5/8	1 1/2	3/4	1/2	3/4	1/2	1 3/4	1.0
4	17794	57	16	38	19	13	19	13	44	0.5
7	7,000	2 7/8	7/8	3 1/2	1 1/2	3/4	1	3/4	3 1/4	4.0
7	31139	73	22	89	38	19	25	19	83	1.8
12	12,000	2 7/8	7/8	3 1/2	1 1/2	3/4	1	3/4	3 1/4	4.0
12	53381	73	22	89	38	19	25	19	83	1.8
25	25,000	3 7/8	1 3/8	5	2 1/8	1	1 1/2	1	4 1/4	10
25	111210	98	35	127	54	25	38	25	108	4.5
35	35,000	4 1/4	1 1/2	5 3/4	2 3/8	1 1/4	1 3/4	1 1/4	5	18
35	155694	108	38	146	60	32	44	32	127	8.2
60	60,000	5 5/8	1 11/16	7 1/4	3	1 1/2	2 1/4	1 1/2	6	36
60	266904	143	43	184	76	38	57	38	152	16
80	80,000	6 1/4	1 13/16	9 1/4	3 5/8	1 3/4	2 1/2	1 3/4	7 3/4	76
80	355872	159	46	235	92	44	64	44	197	34
130	130,000	8 1/2	2 1/16	11 5/8	4 5/8	2 1/2	3 1/4	1 3/4	8 7/8	125
130	578292	216	52	295	117	64	83	44	225	57

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FARENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS

## STATIC AND DYNAMIC RESTRAINTS

### LIGHT DUTY RIGID ROD STRUT

**Figure 2015**

**Size Range:** 700 to 4,000 pounds (3,114 N to 17,792 N) load.

**Material:** Carbon steel except load pin which is stainless steel.

**Service:** For rigid restraint applications where short pin to pin dimensions are required.

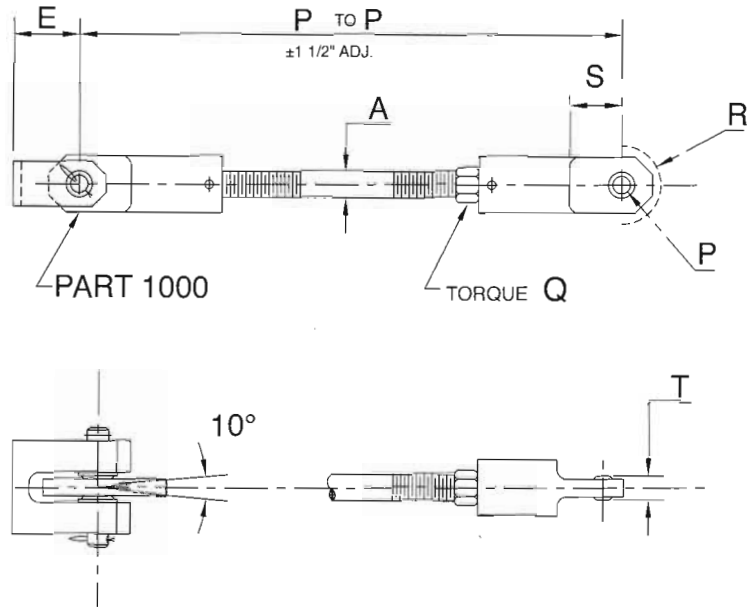
**Installation:** Securely fasten end bracket to structure. Screw rod into paddles and adjust for the desired overall length. Fasten strut to pipe attachment (in place). After all minor adjustments are made the unit is locked by tightening the hex nut against the paddle.

**NOTE:** Rods should be visible in paddle sight holes to insure proper thread engagement.

**Field Adjustment:** Plus or minus 1/2 inch (38 mm).

**Used With:** Carpenter & Paterson Figures 1000, 6175, 6202, 6222, 6252

**Ordering:** Specify figure number, size, strut length (pin to pin length) and customer mark number (if any). Restraint attachments must be ordered separately. For Metric applications specify Figure M2015.



**FIGURE 2015 – LIGHT DUTY RIGID ROD STRUT**

SIZE	LOAD	P to P		A	E	P	R	S	T	WEIGHT MIN. P to P (APPROX.)	TORQUE (Q) (NOMINAL)
		MIN.	MAX.								
.7	700	10 3/4	33	3/4	1 7/8	3/8	1	1 1/2	1/2	6	15
.7	3114	273	838	19	48	10	25	38	13	2.7	20
1.5	1,500	10 3/4	33	3/4	2 1/4	1/2	1 1/8	1 1/2	5/8	9	15
1.5	6673	273	838	19	57	13	29	38	16	4.1	20
4	4,000	13 1/4	36	1	2 1/4	1/2	1 1/4	1 3/4	5/8	12	35
4	17794	337	914	25	57	13	32	44	16	5.4	47

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS

**ADJUSTABLE RIGID STRUT**

**Figure 2250**

**Size Range:** 700 to 130,000 pounds (3,114 N to 578,240 N) load.

**Material:** Carbon steel except load pin which is stainless steel.

**Service:** For rigid restraint applications allowing the greatest amount of field adjustment without field welding .

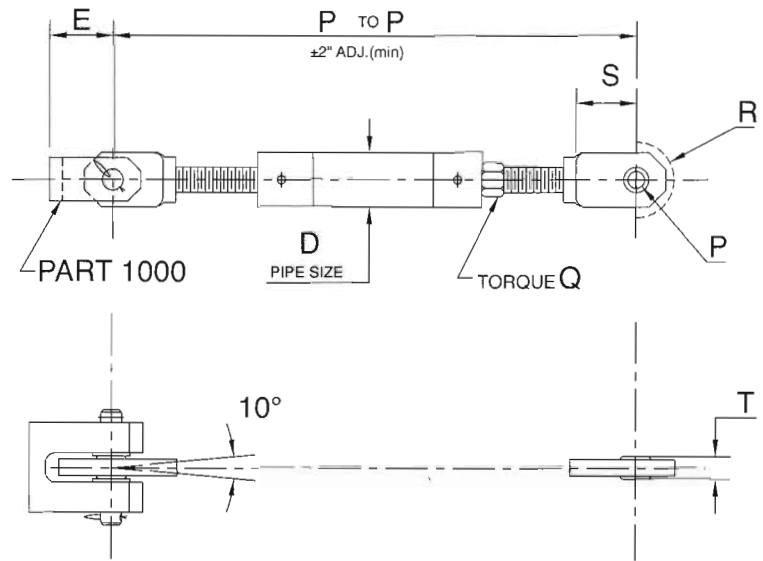
**Installation:** Securely fasten end bracket to structure. Attach strut paddle to end bracket. Adjust strut for the desired overall length. Fasten strut to pipe attachment (in place). After all minor adjustments are made, the unit is locked by tightening the hex nut against the extension piece.

**NOTE:** Rods should be visible in the sight holes at each end of the strut to assure proper thread engagement. Special lengths or other increments available upon request.

**Field Adjustment:** Plus or minus two inches (51 mm) (minimum).

**Used With:** Carpenter and Paterson Figures 6175, 6202, 6222, 6252, 6520, 6521, 6525, 6526.

**Ordering:** Specify figure number, size, strut length (pin to pin length) and customer mark number (if any). For Metric applications specify Figure M2250.



**FIGURE 2015 – LIGHT DUTY RIGID ROD STRUT**

SIZE	LOAD	P to P		PIPE SIZE		E	P	R	S	T	W 2252	WGT. @ MIN. P to P (APPROX.)	TORQUE (Q) (NOMINAL)
		MIN.	MAX.	D	S								
.7	700	20	112	1 1/2	S/40	1 7/8	3/8	1	1 1/2	1/2	1/8	8	15
.7	3114	508	2845	40	S/40	48	10	25	38	13	3	3.6	20
1.5	1,500	20	112	1 1/2	S/40	2 1/4	1/2	1 1/8	1 1/2	5/8	1/8	8	15
1.5	6673	508	2845	40	S/40	57	13	29	38	16	3	3.6	20
4	4,000	26	120	2	S/80	2 1/4	1/2	1 1/4	1 3/4	5/8	1/8	15	35
4	17794	660	3048	50	S/80	57	13	32	44	16	3	6.8	47
7	7,000	26	120	2 1/2	S/80	2 7/8	3/4	2	2 1/2	7/8	1/4	32	100
7	31139	660	3048	65	S/80	73	19	51	64	22	6	15	136
12	12,000	26	120	2 1/2	S/80	2 7/8	3/4	2	2 1/2	7/8	1/4	32	100
12	53381	660	3048	65	S/80	73	19	51	64	22	6	15	136
25	25,000	28	120	3	S/80	3 7/8	1	2 5/8	3	1 3/8	1/4	61	100
25	111210	711	3048	80	S/80	98	25	67	76	35	6	28	136
35	35,000	32	120	3 1/2	S/80	4 1/4	1 1/4	2 5/8	3 1/2	1 1/2	1/4	92	100
35	155694	813	3048	90	S/80	108	32	67	89	38	6	42	136
60	60,000	34	120	5	S/80	5 5/8	1 1/2	3 5/8	3 1/2	1 11/16	3/8	181	100
60	266904	864	3048	125	S/80	143	38	92	89	43	10	82	136
80	80,000	38	120	6	S/80	6 1/4	1 3/4	4 1/8	4	1 13/16	3/8	296	100
80	355872	965	3048	150	S/80	159	44	105	102	46	10	134	136
130	130,000	44	120	8	S/80	8 1/2	2 1/2	6	5 1/4	2 1/16	1/2	560	100
130	578292	1118	3048	200	S/80	216	64	152	133	52	13	254	136

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	FOOT-POUNDS	
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS	

**FIELD WELDED  
ADJUSTABLE RIGID STRUT**

**Figure 2252**

**Size Range:** 700 to 130,000 pounds (3,114 N to 578,240 N) load.

**Material:** Carbon steel except load pin which is stainless steel.

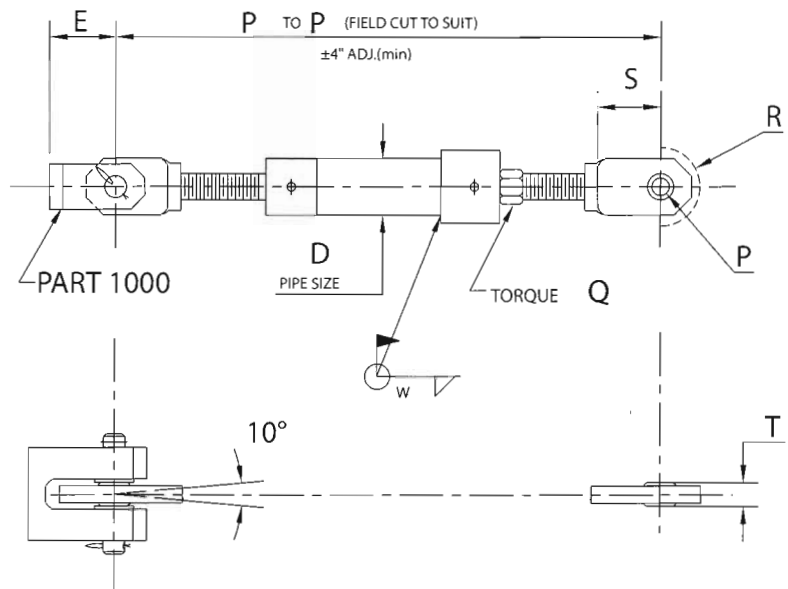
**Service:** For rigid restraint applications where pin to pin dimension is to be determined in the field. All struts will be shipped at maximum pin to pin dimension.

**Installation:** Determine pin to pin dimension, cut strut tube to required length and weld adapter end to strut. Securely fasten end bracket to structure. Adjust strut to desired overall length. Fasten strut to pipe attachment (in place). After all minor adjustments are made, the unit is locked by tightening the hex nut against the extension piece.

**Note:** Rods should be visible in the sight holes at each end of the strut to assure proper thread engagement. One end shipped loose for field welding.

**Field Adjustment:** Plus or minus four inches (102 mm) after final welding.

**Ordering:** Specify part number, size, and customer mark number (if any). For Metric applications specify Figure M2252.



**Note:** For Sizes and Dimensions please refer to Figure 2250 on page 5. For Size 60 through Size 130, insert Field Weld Adapter one inch (1”) into pipe and weld.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS



## VIBRATION CHECK-SWAY BRACES

Carpenter and Paterson has designed its units into six sizes, based on past experience, relating to specific pipe sizes. In general, we recommend the use of these sizes.

**Size Range:** Preloads from 60 to 2,000 pounds (267 N to 8,896 N) up to maximum forces of 240 to 8,000 pounds (1,068 N to 35, 584 N).

**Service:** For controlling vibration, to prevent externally caused pipe sway, as an energy resisting device to oppose shock forces and as a guide or restraint to control pipe line movements.

**Temperature:** 350°F (177°C) for all components except pipe clamp and temperature effect on spring coil.

**Features:**

- Compact and suitable for use in a confined space.
- Each size has 3” (76mm) of travel in either direction.
- All steel construction to protect the spring against damage and weather conditions.
- Nameplate and movement indicator plate are anti-corrosive. These plates are mechanically fastened to prevent accidental removal.
- Paint — standard primer finish.
- Rod coupling allows for field adjustment.

**Optional Feature:** Corrosion Resistant — available for protection against moderate corrosive conditions or severe weather. The unit is galvanized, per ASTM A-153, except the spring which is epoxy powder coated. The final closure weld at time of assembly is metalized.

**Specifications:** All Carpenter and Paterson Vibration Check-Sway Braces are designed to meet the requirement of: Manufacturers Standardization Society SP-58 Type 50 Manufacturers Standardization Society SP-69 and ASME Code for Pressure Piping ASME B31.1 and ASME B31.3

**Type Selection:** Specify a Figure 2303 where adjustability of the preload is desired, in most other cases a Figure 2300 is usually sufficient.

**Size Selection:** The size of the Vibration Check-Sway Brace is determined by calculating the amount of resistive force required by the sway brace to overcome the inertia force of the vibrating object. This is done by taking into consideration the mass, amplitude, frequency and angle of approach of the sway brace from the axis of movement.

**How to Size Assemblies:** The Figures 2301 and 2304 assemblies are recommended where the pin to pin dimensions are small. For assemblies with large pin to pin dimensions, use the Figure 2302 or 2305 assemblies. Refer to the individual assemblies for maximum lengths.

**Final Setting:** The sway brace should be in the neutral (zero force) position when the system is HOT and operating. If not, the rod coupling must be turned to readjust to the neutral position.

**Ordering:** Specify figure number, size, pipe size, preload and length (pin to pin length), customer mark number (if any). Pipe clamp, Figure 6180, must be ordered separately. For Metric applications specify Figures M2300, M2301, M2302, M2303, M2304, M2305.

## SINGLE ADJUSTMENT SWAY BRACE

Figure 2300

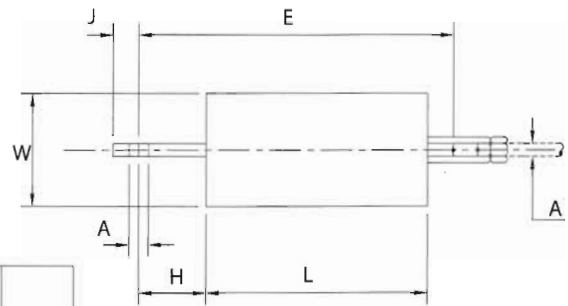


FIGURE 2300 – SINGLE ADJUSTMENT SWAY BRACE

SIZE	RATED LOAD		SPRING RATE	A	E	H	J	L	W
	INITIAL LOAD	MAX. LOAD							
1	60	240	60 lbs./in.	3/4	12 1/4	1 1/2	1	8 5/8	4 3/8
1	267	1068	11 N/mm	19	311	38	25	219	111
2	175	700	175 lbs./in.	1	13 1/8	1 3/4	1 1/4	9	4 3/8
2	778	3114	31 N/mm	25	333	44	32	229	111
3	500	2000	500 lbs./in.	1	17 7/8	1 3/4	1 1/4	13 3/4	4 3/8
3	2224	8896	88 N/mm	25	454	44	32	349	111
4	1000	4000	1000 lbs./in.	1 1/4	17 1/8	2	1 1/2	12 5/8	6 1/2
4	4448	17793	175 N/mm	32	435	51	38	321	165
5	1500	6000	1500 lbs./in.	1 1/2	19 3/8	2 1/2	2	13 7/8	6 1/2
5	6672	26689	263 N/mm	38	492	64	51	352	165
6	2000	8000	2000 lbs./in.	1 1/2	21 1/4	2 1/2	2	15 3/4	6 1/2
6	8896	35586	350 N/mm	38	540	64	51	400	165

**NOTES:** 1) Length adjustment is 1-1/2” (38mm) in either direction when installed in an assembly.  
2) Each size has 3” (76mm) travel in either direction.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	FOOT-POUNDS	
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS	

SINGLE ADJUSTMENT SWAY BRACE ASSEMBLIES

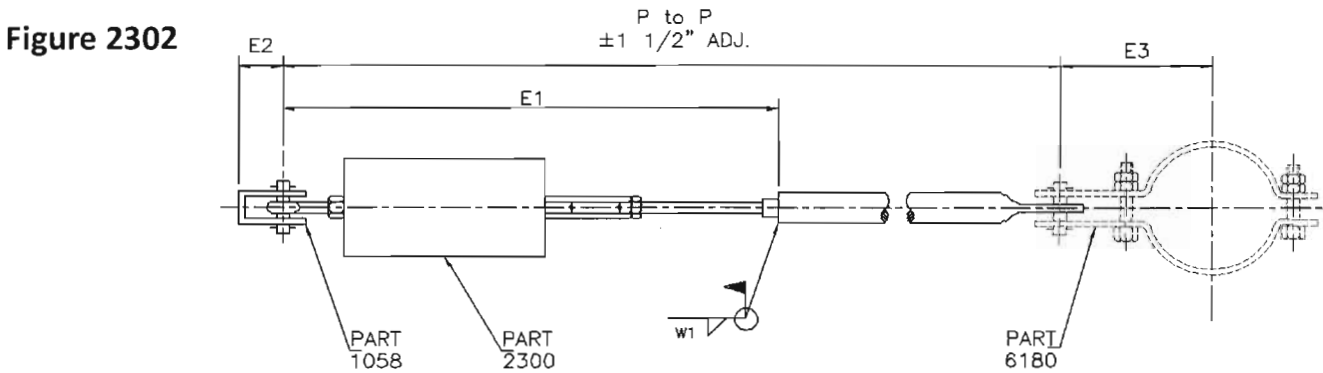
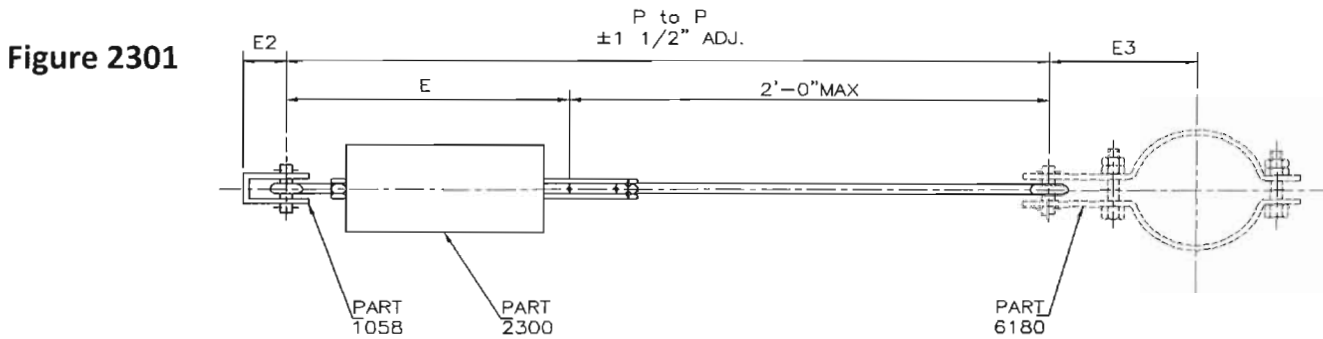


FIGURE 2301, 2302 - SINGLE ADJUSTMENT SWAY BRACE ASSEMBLIES

FIGURE 2301, 2302 SIZE	FIGURE 2300† SIZE	INCHES/MM						
		E	E1	E2	P TO P			W1
					MIN. 2301	MAX. 2301	MAX.* 2302	
1	1	12 1/4	18 1/2	2 1/2	19 1/2	36 1/4	61	1/8
1	1	311	470	64	495	921	1549	3
2	2	13 1/8	19 5/8	3	21 3/8	37 1/8	69	1/8
2	2	333	498	76	543	943	1753	3
3	3	17 7/8	24 3/8	3	26 1/8	41 7/8	74	1/8
3	3	454	619	76	664	1064	1880	3
4	4	17 1/8	24 1/8	3	26 3/8	41 1/8	84	3/16
4	4	435	613	76	670	1045	2134	5
5	5	19 3/8	27 1/8	3	29 5/8	43 3/8	100	1/4
5	5	492	689	76	752	1102	2540	6
6	6	21 1/4	29	3	31 1/2	45 1/4	102	1/4
6	6	540	737	76	800	1149	2591	6

\* Minimum P to P for Part 2302 is maximum P to P for Part 2301.

† Refer to Part 2300 for rated loads, complete dimensions and notes.

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS

## DOUBLE ADJUSTMENT SWAY BRACE

Figure 2303

**Preload Adjustment:**  
 Turn the adjuster nut on the structural attachment end until the desired preload is attained. Turn the compression nut until it takes up the slack. Lock in position. Note that the indicated deflection must be greater than the thermal movement.

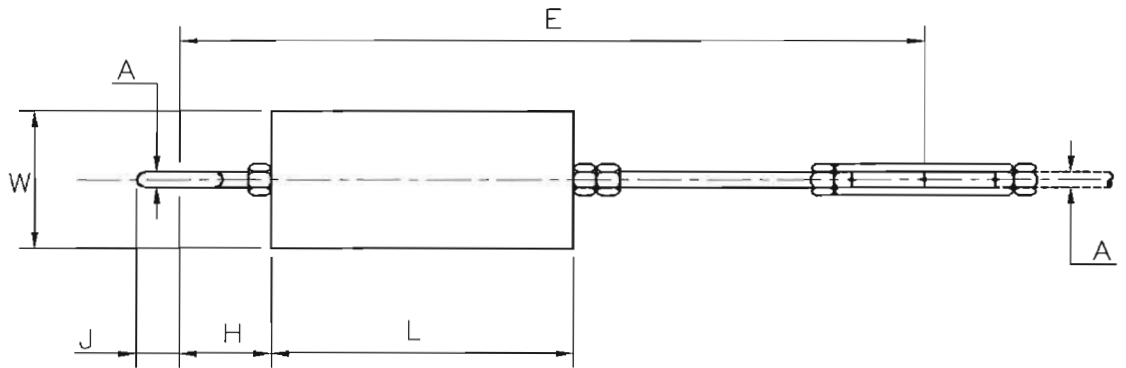


FIGURE 2303- DOUBLE ADJUSTMENT SWAY BRACE ASSEMBLY

SIZE	RATED LOAD		SPRING RATE	A	E	H	J	L	W
	INITIAL LOAD	MAX. LOAD							
1	60	240	60 lbs./in.	3/4	17 5/8	4 5/8	1	9 1/2	4 3/8
1	267	1068	11 N/mm	19	448	117	25	241	111
2	175	700	175 lbs./in.	1	19 1/4	5 1/8	1 1/4	10	4 3/8
2	778	3114	31 N/mm	25	489	130	32	254	111
3	500	2000	500 lbs./in.	1	24	5 1/8	1 1/4	14 3/4	4 3/8
3	2224	8896	88 N/mm	25	610	130	32	375	111
4	1,000	4000	1000 lbs./in.	1 1/4	24	5 5/8	1 1/2	13 3/4	6 1/2
4	4448	17793	175 N/mm	32	610	143	38	349	165
5	1,500	6000	1500 lbs./in.	1 1/2	27 3/8	6 1/4	1 3/4	15 5/8	6 1/2
5	6672	26689	263 N/mm	38	695	159	44	397	165
6	2,000	8000	2000 lbs./in.	1 1/2	29 1/4	6 1/4	1 3/4	17 1/2	6 1/2
6	8896	35586	350 N/mm	38	743	159	44	445	165

- NOTES: 1) Length adjustment is 1-1/2" (38mm) in either direction when installed in an assembly.  
 2) Each size has 3" (76mm) travel in either direction.  
 3) Either of the two forces is adjustable up to the maximum rated load.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS	
MILLIMETERS	CELSUIS	NEWTONS	KILOGRAMS	NEWTON-METERS	

DOUBLE ADJUSTMENT SWAY BRACE ASSEMBLIES

Figure 2304

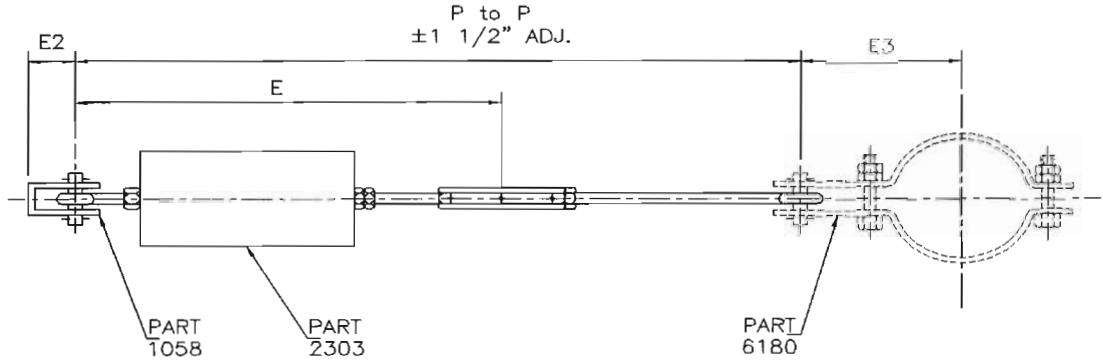


Figure 2305

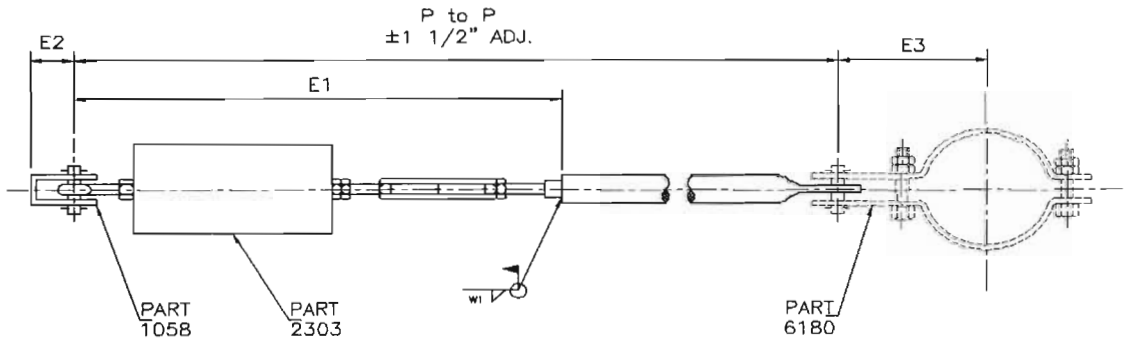


FIGURE 2304, 2305 - DOUBLE ADJUSTMENT SWAY BRACE ASSEMBLIES

FIGURE 2304, 2305 SIZE	FIGURE 2303† SIZE	INCHES/MM						
		E	E1	E2	P TO P			W1
					MIN. 2304	MAX. 2304	MAX.* 2305	
1	1	17 5/8	23 5/8	2 1/2	24 7/8	41 5/8	66	1/8
1	1	448	600	64	632	1057	1676	3
2	2	19 1/4	25 3/4	3	27 1/2	43 1/4	75	1/8
2	2	489	654	76	699	1099	1905	3
3	3	24	30 1/2	3	32 1/4	48	80	1/8
3	3	610	775	76	819	1219	2032	3
4	4	24	31	3	33 1/4	48	91	3/16
4	4	610	787	76	845	1219	2311	5
5	5	27 3/8	35 1/8	3	37 5/8	51 3/8	108	1/4
5	5	695	892	76	956	1305	2743	6
6	6	29 1/4	37	3	39 1/2	57 1/4	110	1/4
6	6	743	940	76	1003	1454	2794	6

\* Minimum P to P for Part 2305 is maximum P to P for Part 2304.

† Refer to Part 2303 for rated loads, complete dimensions and notes.

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
MILLIMETERS	CELSUIS	NEWTONS	KILOGRAMS	NEWTON-METERS

## SWAY BRACE PIPE CLAMP

Figure 6180

**Size Range:** 2 through 24 inches (50 mm to 600 mm).

**Material:** Carbon Steel

**Finish:** Plain

**Service:** For use with our standard line of sway brace assemblies only, in the control of vibration and shock loading.

**Maximum Temperature:** 650°F (343°C) for rated loads shown.

**Features:** Tight fitting load pin.

**Size Selection:** See the chart shown below to match the appropriate clamp to the desired sway brace assembly.

**Ordering:** Specify figure number and pipe size. For Metric applications specify Figure M6180.

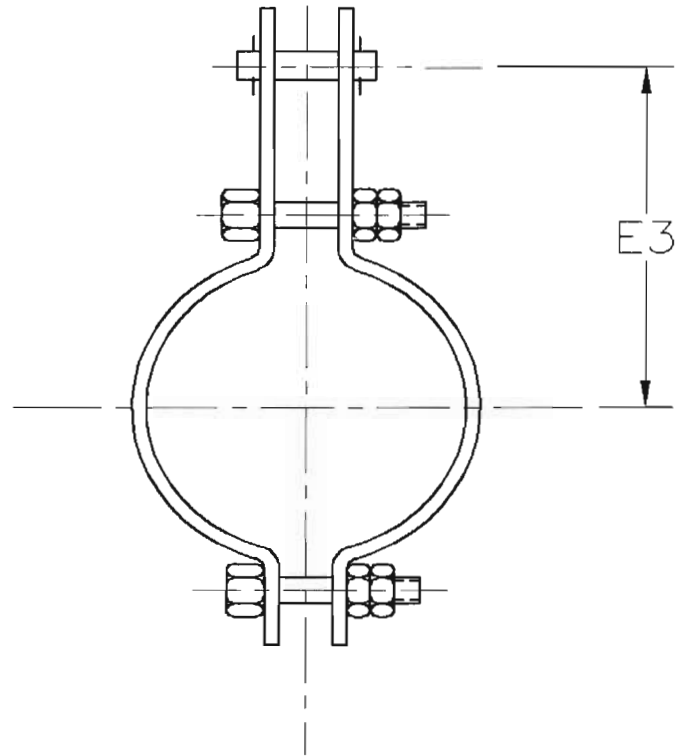


FIGURE 6180 - SWAY BRACE PIPE CLAMP

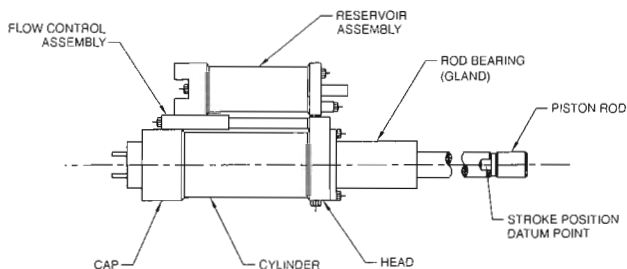
ASSEMBLY SIZE	PIPE SIZE	E3	ASSEMBLY SIZE	PIPE SIZE	E3	ASSEMBLY SIZE	PIPE SIZE	E3	ASSEMBLY SIZE	PIPE SIZE	E3
1	2	5 1/8	2	4	6 1/2	3	10	10 5/8	4*	18	14 7/8
	50	130		100	165		250	270		450	378
	2 1/2	5 1/2		5	7		12	11 7/8		20	16 1/4
	65	140		125	178		300	302		500	413
	3	5 15/16		6	8 5/8		14	13		22	17 1/8
	80	151		150	219		350	330		550	435
	3 1/2	6 3/16		8	9 9/16		16	13 13/16		24	18 1/16
90	157	200	243	400	351	600	459				

\* Sizes 5 and 6 as specified by customer.

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS

## HYDRAULIC SHOCK AND SWAY ARRESTORS

The Carpenter and Paterson Hydraulic Shock and Sway Arrestor is a manifold design hydraulic component consisting of a high pressure main cylinder, a flow control section which contains dual stage velocity sensitive poppet valves, and a spring biased air/oil interface hydraulic reservoir.



**General Application:** Used for the control and protection of piping and equipment subject to shock (impulse) loading and swaying (cyclic) conditions. Its use transfers any imposed forces on the piping or equipment directly to the building structure at the instant of shock occurrence, while at all other times allowing free unrestricted movement through its normal operating range.

### Specific Applications:

- Earthquake protection
- To prevent damage by wind in outdoor installations
- Employed at points in piping systems subject to shock loadings generated by quick closing valves, water hammer, relief valve reaction or other applied shock loads.

**Basic Operation:** The piston rod is free to move in either direction with no restrictions to the fluid flow for all piston velocities up to the activation velocity. At activation velocity the poppet valve, internal to the snubber, closes. Closure of the poppet in either tension or compression greatly reduces the fluid flow through the valve, increasing the pressure on the operating side of the cylinder and generating a resistance force. Post activation flow through grooves in the poppet at rated design capacity of the unit is termed the “bleed rate.” When the applied velocity of the unit becomes zero the poppet valve opens once again, allowing free piston movement.

### Standard Design Features:

- Piping and/or equipment movement is controlled by tamper-proof dual stage flow control poppets designed with self-cleaning orifices.
- Furnished as a complete, compact, and efficient unit, ready for immediate use.
- Manifold configuration requiring no external piping.
- Spherical, self-aligning ball bushings allow for  $\pm 5^\circ$  of angular motion or misalignment.
- Pressurized hydraulic reservoir allows mounting in any spatial orientation.
- Virtually no resistance to normal thermal movements of the piping.
- Paint — standard primer finish.
- Large restraining forces compared to size.
- Functions in restraining tension and compression.
- Stroke determination is made from built-in-datum point located on piston rod.
- Fluid Level Indicator — Provides concise determination of exact fluid level in the unit, thereby eliminating estimate of reserve fluid level.

### Optional Design Features:

- Stroke Position Indicator — A striped piston rod is available for “at-a-glance” determination of stroke position.
- Integral Relief Valve — A non-adjustable valve, which is factory preset at 133%, or 200% of rated load.
- Activation Indicator — At 100 psig or greater, a pop-up device indicates that the unit is restraining load. Must be ordered with optional integral relief valve.
- Rigid Strut Application — When no thermal growth is anticipated after lock-up an optional poppet valve, without bleed, is furnished. Must be ordered with optional integral relief valve.

### Factory Pre-Set:

The units are shipped from the factory complete, tested, reservoir filled to capacity and piston rod pre-set to mate with pin to pin installation dimension.

To determine factory pre-set dimension perform the following calculations.

Compression Stroke:

$$\text{Pre-Set} = \text{Pre-Set Max.} - \left( \frac{\text{Cylinder Stroke} - \text{Thermal Mvt.}}{2} \right)$$

Tension Stroke:

$$\text{Pre-Set} = \text{Pre-Set Min.} + \left( \frac{\text{Cylinder Stroke} - \text{Thermal Mvt.}}{2} \right)$$

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS

## SHORT STRUT HYDRAULIC SNUBBER

Figure 2525

**Size Range:** Available in seven sizes from 3,000 pounds (13,244 N) to 130,000 pounds (578,240 N) and stroke lengths of 6, 12, and 18 inches (152mm, 305mm, and 457mm).

**Service:** For dynamic restraint applications requiring the smallest overall assembly length in tight fit applications.

**Piston Rod Setting:** The factory will preset and clamp the piston rod at the proper Cold installing stroke position. Unless specified otherwise, this setting will position the piston so that its calculated thermal movement will straddle the mid-stroke position of the unit, giving equal reserve at each end of the stroke. See Installation Instructions to determine or change piston rod setting.

**Used With:** Carpenter & Paterson Figures 6175, 6202, 6222, 6252, 6520, 6521, 6525, 6526.

**Ordering:** Specify part number, size, cylinder stroke, thermal movement and direction (tension or compression), preset, overall assembly length (pin to pin in inches), options (if any), and customer mark number (if any). Restraint attachments must be ordered separately. For Metric applications specify Part M2525.

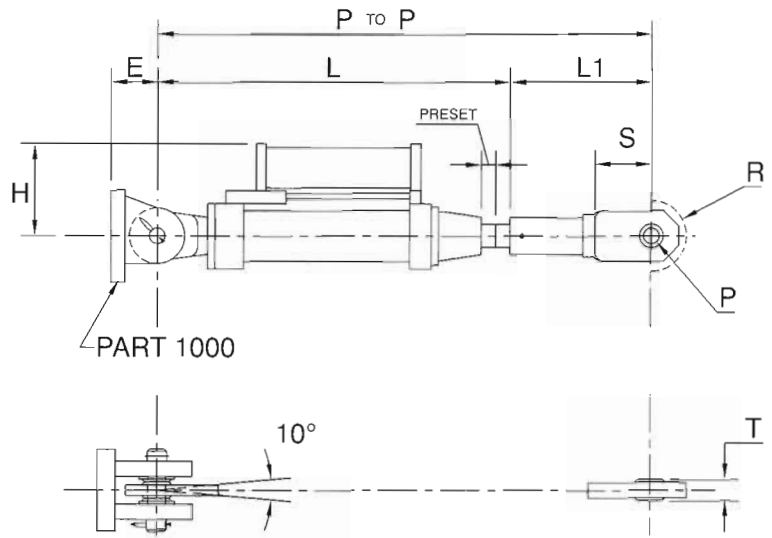


FIGURE 2525 – SHORT STRUT HYDRAULIC SNUBBER

SIZE	MAX. LOAD	INCHES/mm												WEIGHT § (APPROX.)
		CYL. BORE	P to P <sup>†</sup> MIN. §	E	H*	L <sup>†</sup>	L <sup>1</sup>	P	R	S	T	PRESET MIN.	PRESET MAX. §	
3	3,000	1 1/2	22 3/4	2 1/4	5	18 1/4	4 1/2	1/2	1 1/4	1 3/4	5/8	3/4	6 3/4	35
3	13,344	38	578	57	127	464	114	13	32	44	16	19	171	16
10	10,000	2 1/2	26	2 7/8	6	19 3/4	6 1/4	3/4	2	2 1/2	7/8	3/4	6 3/4	70
10	44,480	64	660	73	152	502	159	19	51	64	22	19	171	32
20	20,000	3 1/4	29	3 7/8	6 3/8	21 3/8	7 5/8	1	2 5/8	3	1 3/8	3/4	6 3/4	125
20	88,960	83	737	98	162	543	194	25	67	76	35	19	171	57
30	30,000	4	31 3/8	4 1/4	8 1/2	22 1/2	8 7/8	1 1/4	2 5/8	3 1/2	1 1/2	3/4	6 3/4	155
30	133,440	102	797	108	216	572	225	32	67	89	38	19	171	70
50	50,000	5	33	5 5/8	10 1/4	23	10	1 1/2	3 5/8	3 1/2	1 11/16	3/4	6 3/4	255
50	222,400	127	838	143	260	584	254	38	92	89	43	19	171	116
70	70,000	6	36 3/4	6 1/4	11 7/8	25	11 3/4	1 3/4	4 1/8	4	1 13/16	3/4	6 3/4	410
70	311,360	152	933	159	302	635	298	44	105	102	46	19	171	186
130	130,000	8	42 5/16	8 1/2	16	28 7/16	13 7/8	2 1/2	6	5 1/4	2 1/16	3/4	6 3/4	805
130	578,240	203	1075	216	406	722	352	64	152	133	52	19	171	365

†Unit length fully retracted.

§ Dimensions shown are for 6" (152mm) stroke unit.

For 12" (304mm) and 18" (457mm) Stroke units add stroke difference.

\*Envelope radius.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS

# STATIC AND DYNAMIC RESTRAINTS

## ADJUSTABLE STRUT HYDRAULIC SNUBBER

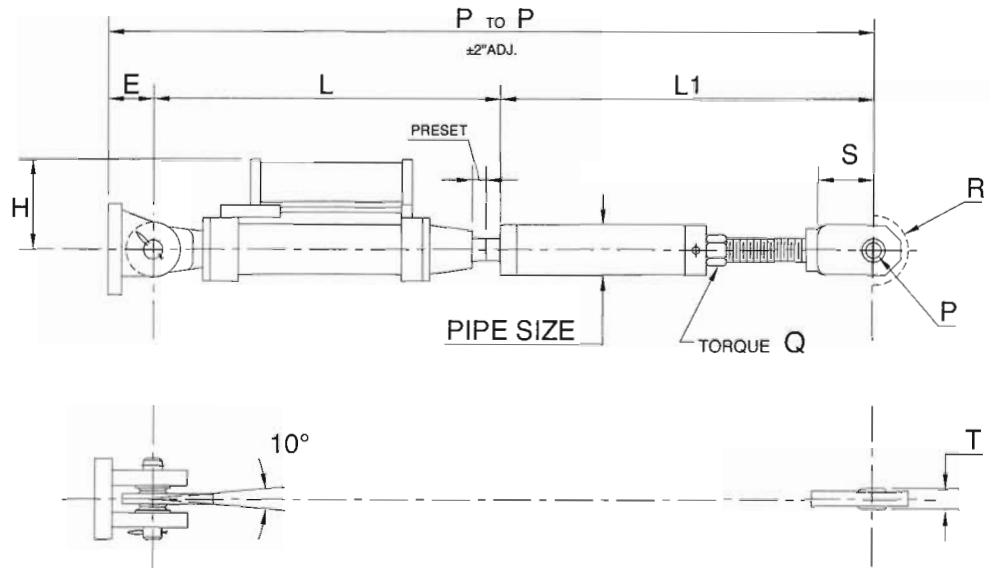
**Figure 2530**

**Size Range:** Available in seven sizes from 3,000 to 130,000 pounds (13,344 N through 578,240 N) and stroke lengths of 6, 12, and 18 inches (152 mm, 305 mm, and 457 mm).

**Service:** For dynamic restraint applications allowing the greatest amount of field adjustment or where the exact overall length must be determined on-site.

**Used With:** Carpenter & Paterson Figures 6175, 6202, 6222, 6252, 6520, 6521, 6525, 6526.

**Ordering:** Specify figure number, size, cylinder stroke, thermal movement and direction (tension or compression), preset, overall assembly length (pin to pin length), options (if any), and customer mark number (if any). Restraint attachments must be ordered separately. For Metric applications specify Figure M2530.



**FIGURE 2530 – ADJUSTABLE STRUT HYDRAULIC SNUBBER**

SIZE	MAX. LOAD	INCHES/mm						WEIGHT <sup>2</sup> (APPROX.)	TORQUE (Q) (NOMINAL)
		P to P <sup>3</sup>		L <sup>3</sup>		PIPE SIZE			
		MIN. <sup>1</sup>	MAX.		L1 (MIN.)				
3	3,000	33 3/8	64	18 1/4	15 1/8	2	S/80	40	35
3	13,344	848	1626	464	384	50	S/80	18	47
10	10,000	36 7/8	69	19 3/4	17 1/8	2 1/2	S/80	75	100
10	44,480	937	1753	502	435	65	S/80	34	136
20	20,000	40 1/8	75	21 3/8	18 3/4	3	S/80	130	100
20	88,960	1019	1905	543	476	80	S/80	59	136
30	30,000	42 7/8	84	22 1/2	20 3/8	3 1/2	S/80	200	100
30	133,440	1089	2134	572	518	90	S/80	91	136
50	50,000	45 3/4	120	23	22 3/4	5	S/80	330	100
50	222,400	1162	3048	584	578	125	S/80	150	136
70	70,000	50 1/4	120	25	25 1/4	6	S/80	530	100
70	311,360	1276	3048	635	641	150	S/80	240	136
130	130,000	57 9/16	120	28 7/16	29 1/8	8	S/80	1050	100
130	578,240	1462	3048	722	740	200	S/80	476	136

For dimensions not given, refer back to Part 2525

<sup>1</sup> Dimensions shown are for 6" (152mm) stroke unit.

For 12" (304mm) and 18" (457mm) Stroke units add stroke difference.

<sup>2</sup> Weight shown is for minimum P to P and 6" (152mm) stroke unit

<sup>3</sup> Unit length fully retracted.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS



**ON-AXIS RESTRAINT YOKE CLAMP**

**Figure 6175**

**Size Range:** 700 to 130,000 pounds (3,114 N through 578,240 N) load.

**Material:** Carbon steel except U-bolt which is alloy steel, and load pin which is stainless steel.

**Finish:** Plain

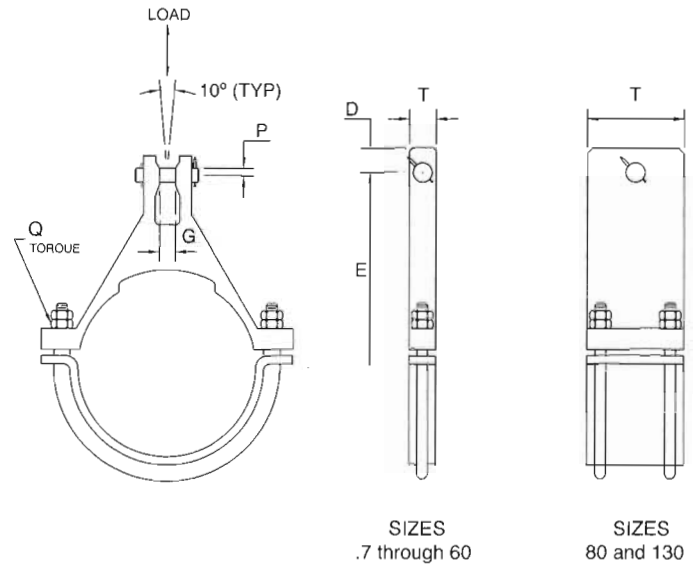
**Max. Temp.:** 650°F (343°C).

**Service:** For non-integral, on-axis, attachment to the piping system in restraint applications.

**Used With:** Carpenter & Paterson Figures 2015, 2250, 2252, 2525, 2530.

**Ordering:** Specify figure number, load size and pipe size. Strut assembly must be ordered separately. For Metric applications specify Figure M6175.

**Note:** This clamp is designed to function within a 10° cone of action, perpendicular to the pipe. Loading beyond this cone is not recommended.



SIZES  
.7 through 60

SIZES  
80 and 130

**FIGURE 6175 - ON-AXIS RESTRAINT YOKE CLAMPS**

SIZE	MAX. LOAD	INCHES/MM				TORQUE (Q) (NOMINAL)
		D	G	P	T	
0.7	700	3/4	1/2	3/8	1	7.5
0.7	3,114	19	13	10	25	10
1.5	1,500	3/4	5/8	1/2	1	32
1.5	6,672	19	16	13	25	43
4	4,000	3/4	5/8	1/2	1 1/4	32
4	17,792	19	16	13	32	43
7	7,000	1 1/4	7/8	3/4	1 3/4	125
7	31,136	32	22	19	44	169
12	12,000	1 1/4	7/8	3/4	1 3/4	125
12	53,376	32	22	19	44	169
25	25,000	2	1 3/8	1	2 1/2	200
25	111,200	51	35	25	64	271
35	35,000	2 1/2	1 1/2	1 1/4	3	600
35	155,680	64	38	32	76	813
60	60,000	2 1/2	1 11/16	1 1/2	3 1/2	1000
60	266,880	64	43	38	89	1356
80	80,000	3 1/4	1 13/16	1 3/4	6	525
80	355,840	83	46	44	152	712
130	130,000	4	2 1/16	2 1/2	8	835
130	578,240	102	52	64	203	1132

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	FOOT-POUNDS	
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS	

# PIPE CLAMPS AND ATTACHMENTS

FIGURE 6175 - ON-AXIS – RESTRAINT YOKE CLAMPS

Yoke Size	.7		1.5		4		7		12		25		35		60		80		130		
	.7		1.5		4		7		12		25		35		60		80		130		
Max. Load	700		1,500		4,000		7,000		12,000		25,000		35,000		60,000		80,000		130,000		
	3,114		6,672		17,792		31,136		53,376		111,200		155,680		266,880		355,840		578,240		
Pipe Size	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	E	WGT.	
3	6	4	6	4.5	6	5	8	13	8	13											
80	152	1.8	152	2.0	152	2.3	203	5.9	203	5.9											
4	6 1/2	5	6 1/2	5.5	6 1/2	6	8 1/2	15	8 1/2	15											
100	165	2.3	165	2.5	165	2.7	216	6.8	216	6.8											
5	7 1/16	6	7 1/16	6	7 1/16	6.5															
125	179	2.7	179	2.7	179	2.9															
6	7 9/16	6	7 9/16	7	7 9/16	8	9 9/16	24	9 9/16	24	10 9/16	34									
150	192	2.7	192	3.2	192	3.6	243	11	243	11	268	15									
8	9 9/16	9	9 9/16	10	9 9/16	11	10 9/16	24	10 9/16	24	11 9/16	40									
200	243	4.1	243	4.5	243	5.0	268	11	268	11	294	18									
10	10 5/8	10	10 5/8	11	10 5/8	12	11 5/8	28	11 5/8	28	12 5/8	48									
250	270	4.5	270	5.0	270	5.4	295	13	295	13	321	22									
12	11 5/8	13	11 5/8	15	11 5/8	16	12 5/8	33	12 5/8	33	13 5/8	53	13 3/8	66	15 1/8	145	15 3/8	200			
300	295	5.9	295	6.8	295	7.3	321	15	321	15	346	24	340	30	384	66	391	91			
14					12 1/4	17	13 1/4	33	13 1/4	33	14 1/4	54	14	70	16	155	17	225	19	400	
350					311	7.7	337	15	337	15	362	24	356	32	406	70	432	102	483	181	
16					13 1/4	19	14 1/4	36	14 1/4	36	15 1/4	57	15	78	17 1/4	175	18	285	20	500	
400					337	8.6	362	16	362	16	387	26	381	35	438	79	457	129	508	227	
18							15 1/4	36	15 1/4	36	16 1/4	65	16	86	18 1/2	185	19	295	21	510	
450							387	16	387	16	413	29	406	39	470	84	483	134	533	231	
20							16 1/4	41	16 1/4	41	17 1/4	70	17	96	19 3/4	205	20	320	23	620	
500							413	19	413	19	438	32	432	44	502	93	508	145	584	281	
24							18 1/4	48	18 1/4	48	21 1/4	96	20	140	22 1/4	270	23	420	25	690	
600							464	22	464	22	540	44	508	64	565	122	584	191	635	313	
30							23 1/4	72	23 1/4	72	24 1/4	124	24	175	26	310	27	540	29	925	
750							591	33	591	33	616	56	610	79	660	141	686	245	737	420	
36												27 1/4	156	27 1/4	220	29	330	32 1/2	730	32	1055
900												692	71	692	100	737	150	826	331	813	479

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	FOOT-POUNDS	
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS	

## RESTRAINT PIPE CLAMPS

### Figure 6202 — Carbon Steel

**Size Range:** 700 to 130,000 pounds (3,114 N through 578,240 N) of load in various pipe sizes from 3/4 inch (20 mm) through 36 inches (900 mm).

**Material:** Carbon steel except the load pin which is stainless steel.

**Service:** For non-integral on-axis attachment to the piping system in restraint applications.

**Max. Temp.:** 650°F (343°C) for the rated loads shown.

**Features:**

- Designed for use with spherical ball bushings.
- Tight tolerances provide for low lost motion.
- Interchangeable with a variety of Carpenter & Paterson struts.

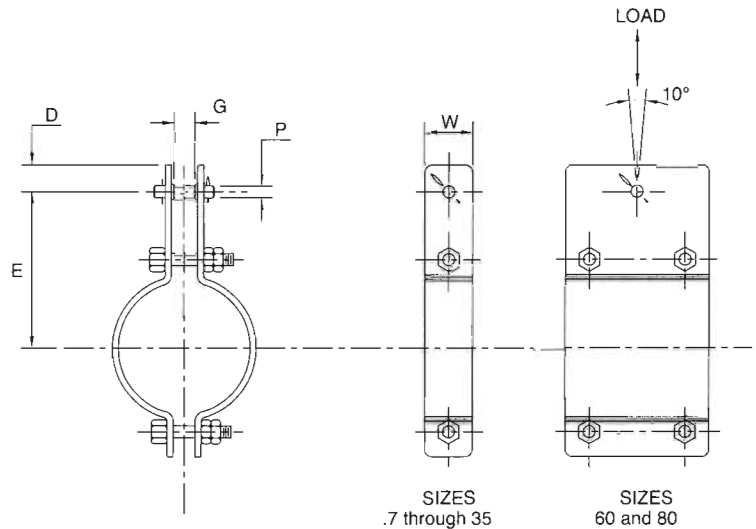
**Used With:** Carpenter & Paterson Figures 2015, 2250, 2252, 2525, 2530.

**Ordering:** Specify figure number, load size, and pipe size. Strut attachment must be ordered separately. For Metric applications specify Figure M6202.

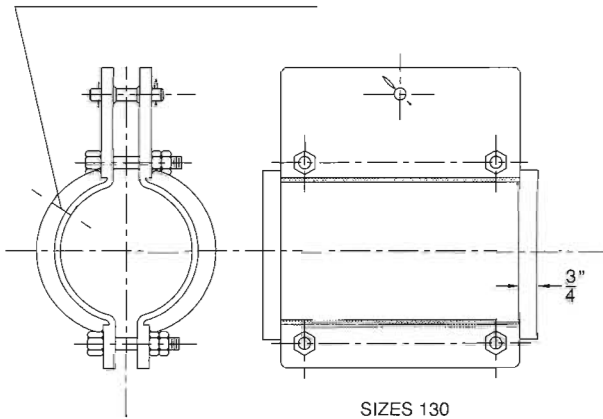
**Installation Note:** Tension bolts to remove slack, (while maintaining dim. "G") plus 1/2 turn of the nut. Then lock jam nut to full nut.

**Note:** This clamp is designed to function within a 10° cone of action, perpendicular to the pipe. Loading beyond this cone is not recommended.

**Note:** Dimensions are shown on the following page.



SIZE 14" TO 24"=4 3/4"  
 SIZE 30", 36"=6 1/4"



### Figure 6222 – Alloy Steel

**Size Range:** Same as Figure 6202.

**Note:** Selected Load Size must be adjusted for the Design temperature.

**Note:** Dimensions shown for the Figure 6202 do not apply.

**Material:** Chrome molybdenum steel.

**Maximum Temperature:** 1200°F (648°C).

**Ordering:** Made special to customer order. Please contact your local Carpenter & Paterson sales office for details. For Metric applications specify Figure M6222.

**Note:** Special clamps can be designed to suit customer requirements.

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT		POUNDS	POUNDS	FOOT-POUNDS
MILLIMETERS	CELSIUS		NEWTONS	KILOGRAMS	NEWTON-METERS

# PIPE CLAMPS AND ATTACHMENTS

**FIGURE 6202 – RESTRAINT PIPE CLAMPS**

LOAD SIZE	.7		1.5		4		7		12		25		35		60		80		130									
MAX. LOAD	700		1,500		4,000		7,000		12,000		25,000		35,000		60,000		80,000		130,000									
PIPE SIZE	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	
3/4	4 1/4	1 1/2	2	4 1/4	2	3																						
20	108	38	0.9	108	51	1.4																						
1	4 1/2	1 1/2	2	4 1/2	2	3																						
25	114	38	0.9	114	51	1.4																						
1 1/4	4 3/4	1 1/2	2	4 3/4	2	3																						
32	121	38	0.9	121	51	1.4																						
1 1/2	4 3/4	1 1/2	2	4 3/4	2	3																						
40	121	38	0.9	121	51	1.4																						
2	5	1 1/2	2	5	2	4																						
50	127	38	0.9	127	51	1.8																						
2 1/2	5 3/4	1 1/2	3	5 3/4	2	4																						
65	146	38	1.4	146	51	1.8																						
3	6	1 1/2	3	6	2	4	7 3/4	2 1/2	17	7 3/4	5	33	7 3/4	5	33													
80	152	38	1.4	152	51	1.8	197	64	7.7	197	127	15	197	127	15													
4	7	1 1/2	3	7	2	7	8 1/4	2 1/2	18	8 1/4	5	34	8 1/4	5	34	9 1/4	5	90										
100	178	38	1.4	178	51	3.2	210	64	8.2	210	127	15	210	127	15	235	127	41										
5	7 1/2	1 1/2	4	7 1/2	2	7	8 3/4	3	23	8 3/4	4 1/2	47	8 3/4	4 1/2	47	10	5	97										
125	191	38	1.8	191	51	3.2	222	76	10	222	114	21	222	114	21	254	127	44										
6	8	1 1/2	4	8	2	8	9 1/2	3	24	9 1/2	4 1/2	51	9 1/2	4 1/2	51	11	5	105										
150	203	38	1.8	203	51	3.6	241	76	11	241	114	23	241	114	23	279	127	48										
8	9 1/2	2	6	9 1/2	2	9	10 1/2	4	35	10 1/2	4 1/2	58	10 1/2	4 1/2	58	12	5	113	12	6	141							
200	241	51	2.7	241	51	4.1	267	102	16	267	114	26	267	114	26	305	127	51	305	152	64							
10	11	2	7	11	2	11	12	4	40	12	5	83	12	5	83	13 1/2	5	125	13 1/2	5	158	13 1/2	6	176	15	9	292	
250	279	51	3.2	279	51	5.0	305	102	18	305	127	38	305	127	38	343	127	57	343	127	72	343	152	80	381	229	132	
12				12	2	16	13	5	55	13	5	90	13	5	90	14 1/2	5	136	14 1/2	5	171	15 1/4	7	241	16	9	316	
300				305	51	7.3	330	127	25	330	127	41	330	127	41	368	127	62	368	127	78	387	178	109	406	229	143	
14							14	4	58	14	5	97	14	5	97	16	5	170	16	6	215	16 3/4	7	258	17	10	368	
350							356	102	26	356	127	44	356	127	44	406	127	77	406	152	98	425	178	117	432	254	167	489
16							15	4	63	15	5	113	15	5	113	17	5	182	17	6	230	17 3/4	7	277	18	10	394	
400							381	102	29	381	127	51	381	127	51	432	127	83	432	152	104	451	178	126	457	254	179	514
18							16	4 1/2	76	16	5	121	16	5	121	18	6	232	18	7	306	18 3/4	7	342	19	11	459	
450							406	114	34	406	127	55	406	127	55	457	152	105	457	178	139	476	178	155	483	279	208	540
20							17	5	91	17	5	131	17	5	131	19	6	252	19	7	326	19 3/4	7	364	20	11	489	
500							432	127	41	432	127	59	432	127	59	483	152	114	483	178	148	502	178	165	508	279	222	565
24							19	4 1/2	125	19	6	175	19	6	175	22	5	280	22	6	345	22 3/4	8	475	23	11	653	
600							483	114	57	483	152	79	483	152	79	559	127	127	559	152	156	578	203	215	584	279	296	616
30							23	4 1/2	151	23	6	260	23	6	260	25	5	338	25	7	487	25 3/4	9	611	26	11	754	
750							584	114	68	584	152	118	584	152	118	635	127	153	635	178	221	654	229	277	660	279	342	
36							26	5	194	26	6	297	26	6	297	28	7	516	28	8	621	28 3/4	10	766	29 1/4	11	981	
900							660	127	88	660	152	135	660	152	135	711	178	234	711	203	282	730	254	347	743	279	445	

**FIGURE 6202 – RESTRAINT PIPE CLAMPS**

Load Size	.7		1.5		4		7		12		25		35		60		80		130	
Max. Load	700		1,500		4,000		7,000		12,000		25,000		35,000		60,000		80,000		130,000	
	3,114		6,672		17,792		31,136		53,376		111,200		155,680		266,880		355,840		578,240	
G	17/32		2 1/32		2 1/32		2 9/32		2 9/32		1 7/16		1 11/32		1 3/4		1 7/8		2 3/32	
G	13		17		17		23		23		37		39		44		48		53	
D	5/8		3/4		7/8		1 1/4		1 1/4		2 1/4		2 5/8		2 1/4		3		3 1/2	
D	16		19		22		32		32		57		67		57		76		89	
P	3/8		1/2		1/2		3/4		3/4		1		1 1/4		1 1/2		1 3/4		2 1/2	
P	10		13		13		19		19		25		32		38		44		64	

DIMENSIONS		TEMPERATURE		LOADS		WEIGHT		TORQUE		
INCHES	FAHRENHEIT	POUNDS	POUNDS	POUNDS	INCH-POUNDS	MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS

**OFF-AXIS RESTRAINT  
PIPE CLAMP**

**Figure 6252**

**Size Range:** 700 to 60,000 pounds (3,114N to 266,880 N ) of load in various pipe sizes from 1½ (40 mm) through 36 (900 mm) inches.

**Material:** Carbon steel except the load pin which is stainless steel.

**Service:** For non-integral off-axis attachment to the piping system in restraint applications.

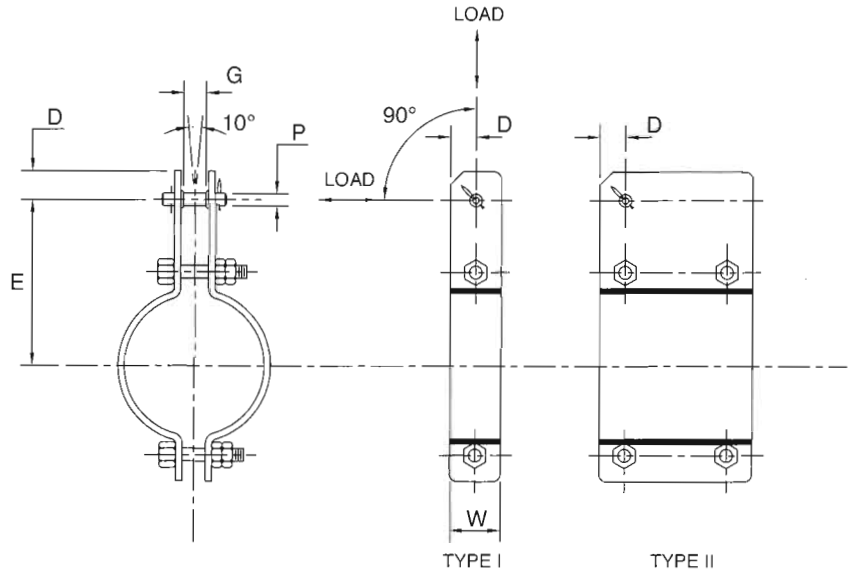
**Max. Temp.:** 650°F (343°C ) for the rated loads shown.

**Used With:** Carpenter & Paterson Figures 2015, 2250, 2252, 2525, 2530.

**Ordering:** Specify figure number, load size, and pipe size. Strut attachment must be ordered separately. For Metric applications specify Figure M6252.

**Note:** This clamp is designed to function within a 10° cone of action and a 90° arc of loading. Loading beyond the cone or arc is not recommended.

**Installation Note:** Tension bolts to remove slack, (while maintaining dimension “G”) plus ½ turn of nut. Then lock jam nut to full nut. This product must be used with shear lugs supplied by others. (Dimensions are shown on the following page.)



DIMENSIONS		TEMPERATURE	LOADS	WEIGHT		TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	POUNDS	FOOT-POUNDS	
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS		

# PIPE CLAMPS AND ATTACHMENTS

**FIGURE 6252 – OFF AXIS RESTRAINT PIPE CLAMP**

LOAD SIZE	.7	1.5	4	7	12	25	35	60													
MAX. LOAD	700	1,500	4,000	7,000	12,000	25,000	35,000	60,000													
PIPE SIZE	3,114	6,672	17,792	31,136	53,376	111,200	155,680	266,880													
PIPE SIZE	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.	E	W	WGT.
1½	4¾	2	6																		
40	121	51	2.7																		
2	5	2	6	5	3	12															
50	127	51	2.7	127	76	5.4															
2½	5¾	2½	8	5¾	3	13															
65	146	64	3.6	146	76	5.9															
3	6	2½	9	6	3	14	7¾	6	57												
80	152	64	4.1	152	76	6.4	197	152	26												
4	7	2½	10	7	3	19	8¼	5	66	8¼	7	104	8¼	7	104						
100	178	64	4.5	178	76	8.6	210	127	30	210	178	47	210	178	47						
5	7½	2½	11	7½	3	21	8¾	5	71	8¾	7	114	8¾	7	114	10	9	199			
125	191	64	5.0	191	76	9.5	222	127	32	222	178	52	222	178	52	254	229	90			
6	8	3	15	8	3	27	9½	5	78	9½	7	125	9½	7	125	11	8	224			
150	203	76	6.8	203	76	12	241	127	35	241	178	57	241	178	57	279	203	102			
8	9½	3	19	9½	3	32	10½	5	89	10½	7	143	10½	7	143	12	9	281	13	13	430
200	241	76	8.6	241	76	15	267	127	40	267	178	65	267	178	65	305	229	127	330	330	195
10	11	3	28	11	4	48	12	6	122	12	8	187	12	8	187	13½	10	354	14	14	511
250	279	76	13	279	102	22	305	152	55	305	203	85	305	203	85	343	254	161	356	356	232
12	12	3	31	12	4	53	13	6	137	13	8	212	13	8	212	15	11	437	15½	15	610
300	305	76	14	305	102	24	330	152	62	330	203	96	330	203	96	381	279	198	394	381	277
14	13	3	34	13	4	57	14	6	145	14	7	241	14	7	241	16	11	465	16	15	642
350	330	76	15	330	102	26	356	152	66	356	178	109	356	178	109	406	279	211	406	381	291
16	14	3	37	14	4	63	15	7	165	15	7	261	15	7	261	17	12	549	17	15	695
400	356	76	17	356	102	29	381	178	75	381	178	118	381	178	118	432	305	249	432	381	315
18				15	5	84	16	7	195	16	7	283	16	7	283	18	12	591	18	15	746
450				381	127	38	406	178	88	406	178	128	406	178	128	457	305	268	457	381	338
20				16	5	90	17	7	210	17	8	346	17	8	346	19	12	632	19½	16	861
500				406	127	41	432	178	95	432	203	157	432	203	157	483	305	287	495	406	391
22							18	7	265	18	8	371	18	8	371						
550							457	178	120	457	203	168	457	203	168						
24							19	7	295	19	8	395	19	8	395	22	14	865	22½	16	1258
600							483	178	134	483	203	179	483	203	179	559	356	392	572	406	571
26							20	7	310	20	9	471	20	9	471						
650							508	178	141	508	229	214	508	229	214						
28							22	7	383	22	8	526	22	8	526						
700							559	178	174	559	203	239	559	203	239						
30							23	7	405	23	8	556	23	8	556	25	15	1086	25½	16	1474
750							584	178	184	584	203	252	584	203	252	635	381	493	648	406	669
32							24	7	425	24	8	583	24	8	583						
800							610	178	193	610	203	264	610	203	264						
34							25	7	446	25	9	685	25	9	685						
850							635	178	202	635	229	311	635	229	311						
36							26	8	463	26	9	717	26	9	717	28	16	1327	29	16	1695
900							660	203	210	660	229	325	660	229	325	711	406	602	737	406	769

Sizes above and to the left of solid line are Type I. Sizes to the right and below are Type II.

Load Size	.7	1.5	4	7	12	25	35	60
	.7	1.5	4	7	12	25	35	60
Max. Load	700	1,500	4,000	7,000	12,000	25,000	35,000	60,000
	3,114	6,672	17,792	31,136	53,376	111,200	155,680	266,880
G	17/32	21/32	21/32	29/32	29/32	17/16	117/32	1¾
G	13	17	17	23	23	37	39	44
D	7/16	5/8	7/8	1¼	1¼	2¼	2¾	2¼
D	11	16	22	32	32	57	67	57
P	¾	½	½	¾	¾	1	1¼	1½
P	10	13	13	19	19	25	32	38

## RESTRAINT RISER CLAMPS

### Figure 6280 — Carbon Steel

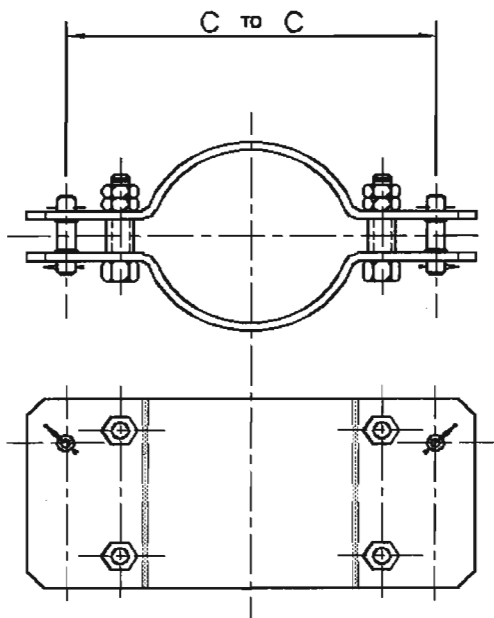
**Material:** Carbon steel except load pin which is stainless steel

**Finish:** Plain.

**Maximum Temperature:** 650°F (343°C).

**Service:** For axial restraint of vertical or horizontal piping where two struts are required. Load is carried by shear lugs which are welded to the pipe.

**Ordering:** Specify part number, exact pipe O.D., load, operating temperature, C-C dimension and strut size. Strut assembly must be ordered separately. For Metric applications specify Figure M6280.



TYPE 2

### Figure 6281 — Alloy Steel

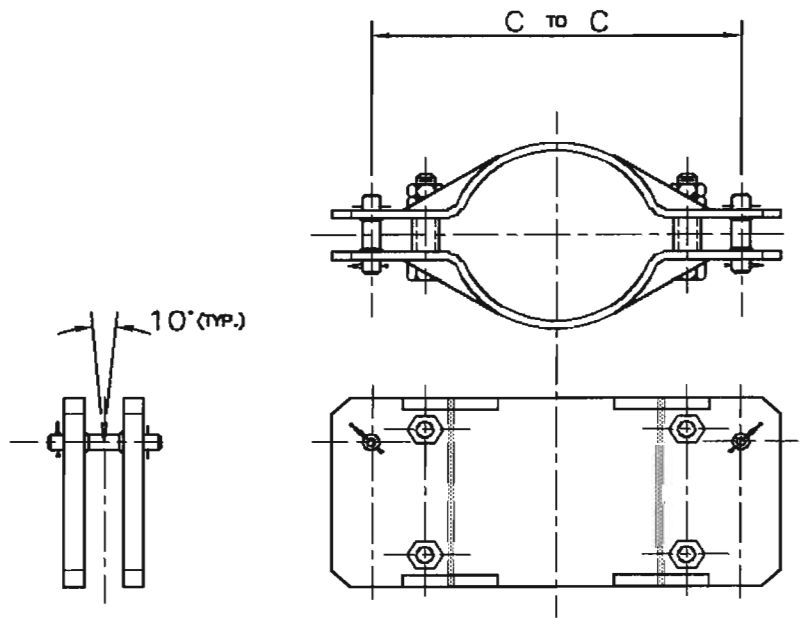
**Material:** Chrome molybdenum steel except load pin which is stainless steel.

**Finish:** Plain.

**Maximum Temperature:** 1100°F (593°C).

**Service:** For axial restraint of vertical or horizontal piping where two struts are required. Load is carried by shear lugs which are welded to the pipe.

**Ordering:** Specify part number, exact pipe O.D., load, operating temperature, C-C dimension and strut size. Strut assembly must be ordered separately. For Metric applications specify Figure M6281.



TYPE 3

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
MILLIMETERS	CELSUIS	NEWTONS	KILOGRAMS	NEWTON-METERS

WELDING LUG ATTACHMENT

Figure 6410

**Size Range:** 700 to 60,000 pounds (3,114 N to 266,880 N) load for various pipe sizes from 1½" (40 mm) through 36" (900 mm).

**Material:** Carbon steel except the load pin which is stainless steel.

**Service:** For integral attachment to a piping system in restraint applications.

**Maximum Temperature:** 650°F (343°C) for the rated loads shown.

**Ordering:** Specify figure number, load size, and pipe size. Strut assembly must be ordered separately. For Metric applications specify Figure M6410.

**Note:** This product is designed to function within a 10° cone of action and a 180° arc of loading. Load-ing beyond the cone or arc is not recommended.

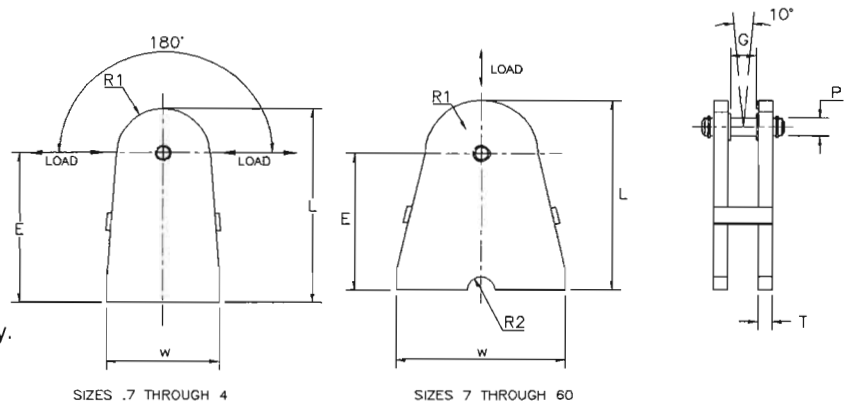


FIGURE 6410 - WELDING LUG ATTACHMENT

YOKE SIZE	.7					1.5					4					7					
MAX. LOAD	700					1500					4000					7000					
LOAD	3114					6672					17792					31136					
PIPE SIZE	E	L	W	*Ins.	Wgt.	E	L	W	*Ins.	Wgt.	E	L	W	*Ins.	Wgt.	E	L	W	*Ins.	Wgt.	
1 1/2	3 3/4	4 3/8	3	2 7/8	1.4	3 3/4	4 5/8	3	2 5/8	1.6	3 3/4	5	3	2 1/8	2.8						
40	95	111	76	73	0.6	95	117	76	67	0.7	95	127	76	54	1.3						
2	3 3/4	4 3/8	3	2 7/8	1.4	3 3/4	4 5/8	3	2 5/8	1.6	3 3/4	5	3	2 1/8	2.8						
50	95	111	76	73	0.6	95	117	76	67	0.7	95	127	76	54	1.3						
2 1/2	4 1/4	4 7/8	3	3 3/8	1.5	4 1/4	5 1/8	3	3 1/8	1.8	4 1/4	5 1/2	3	2 5/8	3.1						
65	108	124	76	86	0.7	108	130	76	79	0.8	108	140	76	67	1.4						
3	4 1/4	4 7/8	3	3 3/8	1.5	4 1/4	5 1/8	3	3 1/8	1.8	4 1/4	5 1/2	3	2 5/8	3.1	6	7 1/2	6	3 7/8	9.2	
80	108	124	76	86	0.7	108	130	76	79	0.8	108	140	76	67	1.4	152	191	152	98	4.2	
4	4 3/4	5 3/8	4	3 7/8	2	4 3/4	5 5/8	4	3 5/8	2.4	4 3/4	6	4	3 1/8	4	6	7 1/2	6	3 7/8	9.2	
100	121	137	102	98	0.9	121	143	102	92	1.1	121	152	102	79	1.8	152	191	152	98	4.2	
5	4 3/4	5 3/8	4	3 7/8	2	4 3/4	5 5/8	4	3 5/8	2.4	4 3/4	6	4	3 1/8	4	6	7 1/2	6	3 7/8	9.2	
125	121	137	102	98	0.9	121	143	102	92	1.1	121	152	102	79	1.8	152	191	152	98	4.2	
6	4 3/4	5 3/8	4	3 7/8	2	4 3/4	5 5/8	4	3 5/8	2.4	4 3/4	6	4	3 1/8	4	6 1/4	7 3/4	6	4 1/8	9.5	
150	121	137	102	98	0.9	121	143	102	92	1.1	121	152	102	79	1.8	159	197	152	105	4.3	
8	5 1/4	5 7/8	4	4 3/8	2.3	5 1/4	6 1/8	4	4 1/8	2.6	5 1/4	6 1/2	4	3 5/8	4.4	6 1/4	7 3/4	6	4 1/8	9.5	
200	133	149	102	111	1.0	133	156	102	105	1.2	133	165	102	92	2.0	159	197	152	105	4.3	
10	5 1/2	6 1/8	4	4 5/8	2.4	5 1/2	6 3/8	4 1/8	4 3/8	2.7	5 1/2	6 3/4	4	3 7/8	4.6	6 3/4	8 1/4	6	4 5/8	10	
250	140	156	102	117	1.1	140	162	105	111	1.2	140	171	102	98	2.1	171	210	152	117	4.6	
12	5 1/2	6 1/8	4	4 5/8	2.4	5 1/2	6 3/8	4 1/8	4 3/8	2.7	5 1/2	6 3/4	4	3 7/8	4.6	6 3/4	8 1/4	6	4 5/8	10	
300	140	156	102	117	1.1	140	162	105	111	1.2	140	171	102	98	2.1	171	210	152	117	4.6	
14											6	7 1/4	5	4 3/8	5.6	7	8 1/2	6	4 7/8	11	
350											152	184	127	111	2.5	178	216	152	124	4.8	
16											6	7 1/4	5	4 3/8	5.6	7	8 1/2	6	4 7/8	11	
400											152	184	127	111	2.5	178	216	152	124	4.8	
18																7	8 1/2	6	4 7/8	11	
450																178	216	152	124	4.8	
20																7	8 1/2	6	4 7/8	11	
500																178	216	152	124	4.8	
24																7	8 1/2	6	4 7/8	11	
600																178	216	152	124	4.8	
30																8	9 1/2	7	5 7/8	12	
750																203	241	178	149	5.3	
36																8	9 1/2	7	5 7/8	12	
900																203	241	178	149	5.3	

\* Maximum insulation thickness.

DIMENSIONS	TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
MILLIMETERS	CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS



## PIPE CLAMPS AND ATTACHMENTS

**FIGURE 6410 – WELDING LUG ATTACHMENT (CONT.)**

YOKE SIZE	12					25					35					60					
	12					25					35					60					
MAX. LOAD	12,000					25,000					35,000					60,000					
	53,376					111,200					155,680					266,880					
PIPE SIZE	E	L	W	*INS.	WGT.	E	L	W	*INS.	WGT.	E	L	W	*INS.	WGT.	E	L	W	*INS.	WGT.	
1½																					
40																					
2																					
50																					
2½																					
65																					
3	6	7½	6	3⅞	9.2																
80	152	191	152	98	4.2																
4	6	7½	6	3⅞	9.2	7	9½	9	3⅞	26											
100	152	191	152	98	4.2	178	241	229	98	12											
5	6	7½	6	3⅞	9.2	7¼	9¾	9	4½	27											
125	152	191	152	98	4.2	184	248	229	105	12											
6	6¼	7¾	6	4½	9.5	7¾	10¼	9	4¾	28											
150	159	197	152	105	4.3	197	260	229	117	13											
8	6¼	7¾	6	4½	9.5	7¾	10¼	9	4¾	28	7¾	10¼	10	4½	39						
200	159	197	152	105	4.3	197	260	229	117	13	197	273	254	105	18						
10	6¾	8¼	6	4¾	10	8	10½	9	4¾	29	8	11	10	4¾	40	8	11	12	3⅞	51	
250	171	210	152	117	4.6	203	267	229	124	13	203	279	254	111	18	203	279	305	98	23	
12	6¾	8¼	6	4¾	10	8	10½	9	4¾	29	8	11	10	4¾	40	8	11	12	3⅞	51	
300	171	210	152	117	4.6	203	267	229	124	13	203	279	254	111	18	203	279	305	98	23	
14	7	8½	6	4¾	11	9	11½	9	5¾	32	9	12	10	5¾	44	9	12	12	4¾	56	
350	178	216	152	124	4.8	229	292	229	149	15	229	305	254	137	20	229	305	305	124	25	
16	7	8½	6	4¾	11	9	11½	9	5¾	32	9	12	10	5¾	44	9	12	12	4¾	56	
400	178	216	152	124	4.8	229	292	229	149	15	229	305	254	137	20	229	305	305	124	25	
18	7	8½	6	4¾	11	9	11½	9	5¾	32	9	12	10	5¾	44	9	12	12	4¾	56	
450	178	216	152	124	4.8	229	292	229	149	15	229	305	254	137	20	229	305	305	124	25	
20	7	8½	6	4¾	11	9	11½	9	5¾	32	9	12	10	5¾	44	9	12	12	4¾	56	
500	178	216	152	124	4.8	229	292	229	149	15	229	305	254	137	20	229	305	305	124	25	
24	7	8½	6	4¾	11	10	12½	10	6¾	37	10	13	12	6¾	54	10	13	15	5¾	71	
600	178	216	152	124	4.8	254	318	254	175	17	254	330	305	162	24	254	330	381	149	32	
30	8	9½	7	5¾	12	10	12½	10	6¾	37	10	13	12	6¾	54	10	13	15	5¾	71	
750	203	241	178	149	5.3	254	318	254	175	17	254	330	305	162	24	254	330	381	149	32	
36	8	9½	7	5¾	12	10	12½	10	6¾	37	10	13	12	6¾	54	10	13	15	5¾	71	
900	203	241	178	149	5.3	254	318	254	175	17	254	330	305	162	24	254	330	381	149	32	

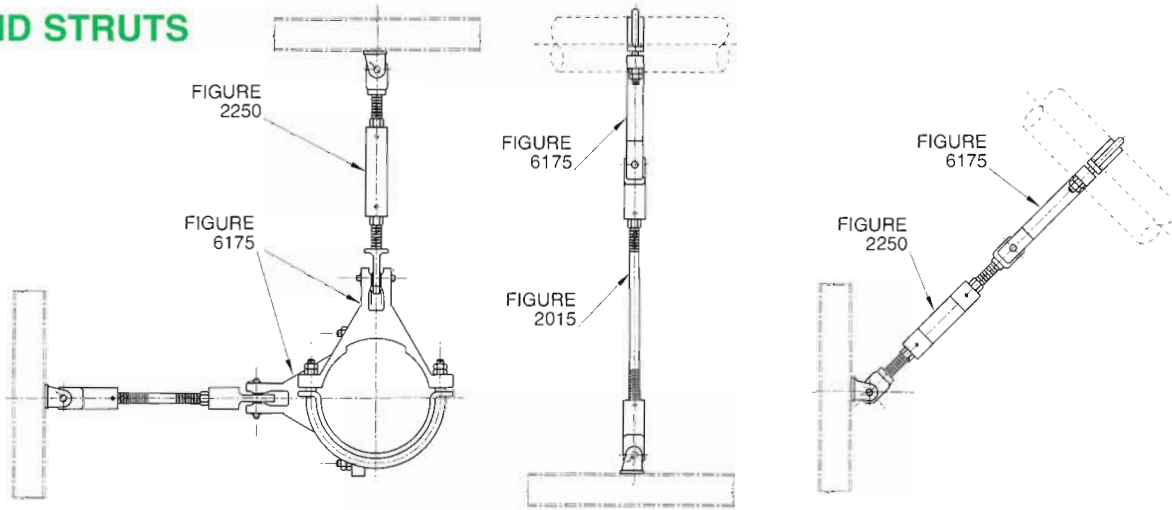
\* Maximum insulation thickness

**FIGURE 6410 – WELDING LUG ATTACHMENT**

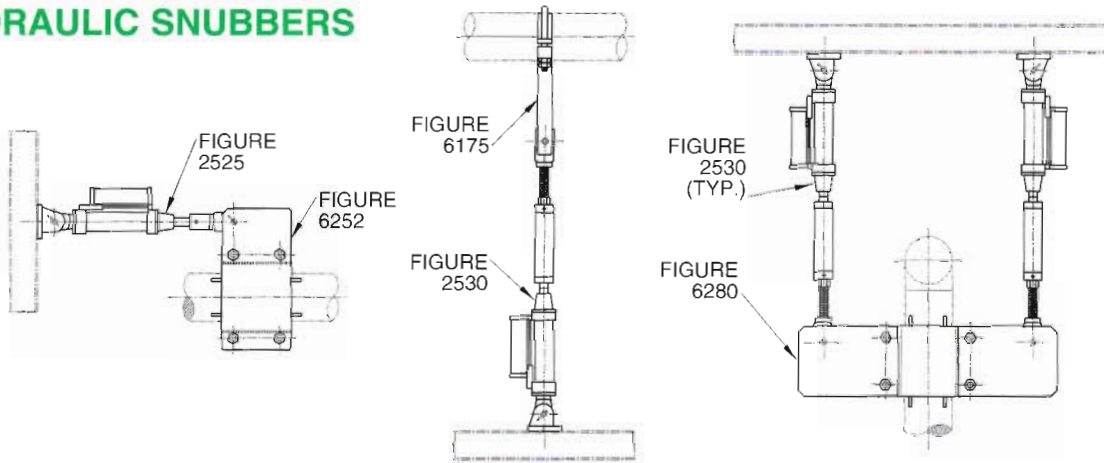
SIZE	.7	1.5	4	7	12	25	35	60
	.7	1.5	4	7	12	25	35	60
MAX. LOAD	700	1,500	4,000	7,000	12,000	25,000	35,000	60,000
	3,114	6,672	17,792	31,136	53,376	111,200	155,680	266,880
G	½	⅝	⅝	⅞	⅞	1⅜	1½	1⅞
G	13	16	16	22	22	35	38	43
P	⅜	½	½	¾	¾	1	1¼	1½
P	10	13	13	19	19	25	32	38
R1	⅝	⅞	1¼	1½	1½	2½	3	3
R1	16	22	32	38	38	64	76	76
R2				½	½	¾	⅞	1
R2				13	13	19	22	25
T	¼	¼	⅜	½	½	¾	⅞	1
T	6	6	10	13	13	19	22	25

DIMENSIONS		TEMPERATURE	LOADS	WEIGHT	TORQUE
INCHES	MILLIMETERS	FAHRENHEIT	POUNDS	POUNDS	INCH-POUNDS
		CELSIUS	NEWTONS	KILOGRAMS	NEWTON-METERS

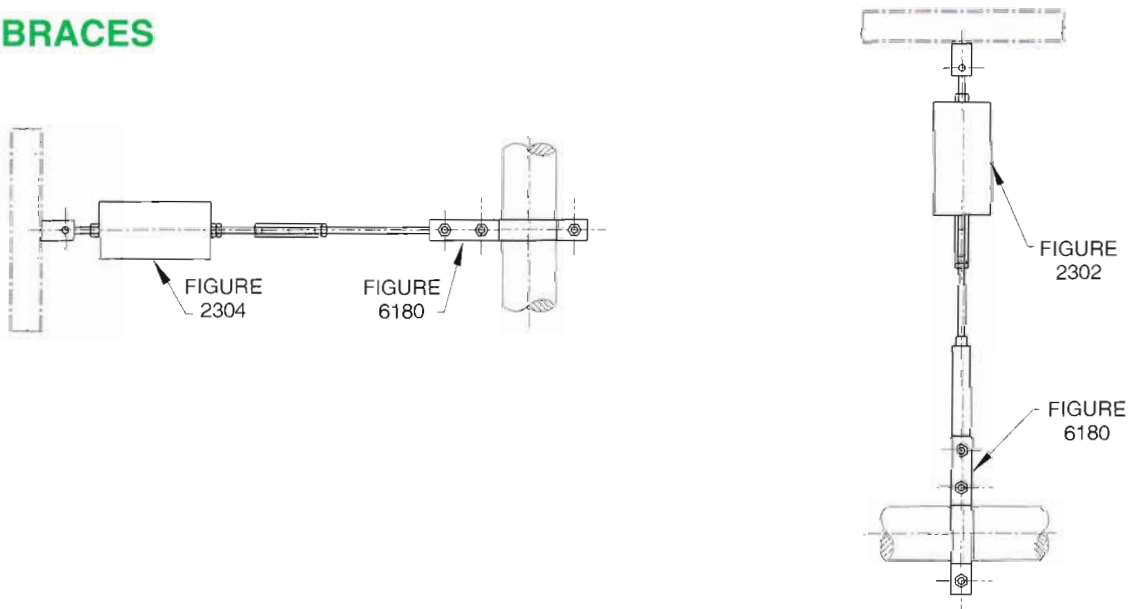
**RIGID STRUTS**



**HYDRAULIC SNUBBERS**



**SWAY BRACES**



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